Bachelor

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Downtime

Facilitating psychological detachment through artefact-based reflection

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Abstract

Knowledge workers profit immensely from modern technologies and use them for many aspects of their work. But these technologies also come with drawbacks, as people are now more than ever expected to be available at all times via their work devices. This can lead to blurring boundaries between ones work and private life, which in turn can have negative effects on the ability to psychologically detach from work and enjoy non-work time. In this study we introduce the concept of artefact-based reflection, a method through which knowledge workers can reflect on so called work-artefacts, like tabs, files or e-mails, that they worked with throughout their day and "clean up their workplace" at the end of their workday. Based on existing research and this new concept we developed *Downtime*, an application which aims at helping knowledge workers in facilitating psychological detachment through artefact-based reflection. We then conducted a user study over two weeks to evaluate the effects of our application. Our findings suggest that knowledge workers can increase their detachment from work and create mental boundaries between their work and non-work lives through reflecting upon the work-artefacts they used that day, especially when they were not actively seeking detachment from their work beforehand. Further research is necessary to evaluate the long-term effects of artefact-based reflection on a broader range of knowledge workers.

Zusammenfassung

Wissensarbeiter profitieren in hohem Maße von modernen Technologien und nutzen sie für viele Aspekte ihrer Arbeit. Diese Technologien bringen aber auch Nachteile mit sich, da von diesen Arbeitern heute mehr denn je erwartet wird, dass sie über ihre Arbeitsgeräte jederzeit erreichbar sind. Dies kann dazu führen, dass die Grenzen zwischen Arbeit und Privatleben verschwimmen, was wiederum negative Auswirkungen auf die Fähigkeit, sich psychologisch von der Arbeit zu lösen und die arbeitsfreie Zeit zu genießen, haben kann. In dieser Studie führten wir das Konzept der Artefakt-basierten Reflexion ein. Dies ist eine Methode, mit der Wissensarbeiter über so genannte Arbeitsartefakte wie Tabs, Dateien oder E-Mails, mit denen sie während ihres Arbeitstages gearbeitet haben, reflektieren und am Ende ihres Arbeitstages ihren Arbeitsplatz "aufräumen" können. Auf der Grundlage bestehender Forschungen und dieses neuen Konzepts entwickelten wir *Downtime*, eine Anwendung, die Wissensarbeitern dabei helfen soll, sich durch artefakt-basierte Reflexion psychologisch abzugrenzen. Anschließend führten wir eine zweiwöchige Nutzerstudie durch, um die Effekte unserer Anwendung zu evaluieren. Unsere Ergebnisse deuten darauf hin, dass Wissensarbeiter sich von der Arbeit verstärkt distanzieren und mentale Grenzen zwischen ihrem Arbeits- und ihrem Nicht-Arbeitsleben schaffen können, indem sie über die Arbeits-Artefakte nachdenken, die sie an diesem Tag benutzt haben. Dieser Effekt erwies sich als besonders stark wenn die Wissensarbeiter sich vorher nicht aktiv von ihrer Arbeit distanziert haben. Weitere Forschung ist notwendig, um die langfristigen Auswirkungen der Artefakt-basierten Reflexion auf Wissensarbeiter zu untersuchen.

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Chapter 1

Introduction

When working with information and communication technologies (ICT), the urge to always be available, even after work hours, is constant and can have grave consequences for a knowledge worker's well-being and job performance. Knowledge workers are individuals who use their brain more than their muscles while working and therefore consider information as their main capital [Kid94, Mlá11]. The Internet, for example, allows people to always get connected to coworkers and stay alert for any incoming tasks, which can impact productivity negatively [WST08]. Psychological detachment, meaning a "sense of being away from the work situation" [EEL98], supports knowledge workers in mentally disconnecting from work and thus facilitate well-being and lower fatigue [HSMNK21, SBM10]. Contrarily, a lack of detachment can increase the risk of burnout and general low life satisfaction [SF15]. But not only the personal lives of knowledge workers are being affected negatively by a low level of detachment as their job performance and work engagement also suffers when thinking about work during leisure time [SBM10, Son12, WKM+18].

Previous research studies have explored ways to help knowledge workers detach from their workday [WKM+18, Kol22]. *SwitchBot* was developed as a conversational bot, with which workers could engage at the start and end of their workday to focus on their work-related tasks and emotions through structured dialogues. They found that the application could help them to increase productivity and help with detachment and reattachment processes around work [WKM+18]. A different approach was taken with the *Shutdown Helper*. This desktop application, which encourages users to perform a shutdown ritual at the end of their workday was created to help promoting a mental transition from work to leisure with the goal of facilitating psychological detachment from work. The ritual comprises multiple steps the users can go through, such as creating a task list, meditating and writing down an evening resolution for themselves. It was shown in a user study that performing the ritual does indeed help in detaching from work, although not all individual parts of the ritual were equally successful [Kol22].

Knowledge workers use various different work-related artefacts throughout their day, such as files, tabs or e-mails. These pieces of information play a huge role in the daily life of these workers as nearly every aspect of their work revolves around some kind of work-artefact. Although prior research, as shown above, has examined the idea of facilitating psychological detachment at the end of a workday through the use of digital applications, work-artefacts have been left out of these approaches so far.

In order to address the aforementioned research gap, we introduce a new concept, called artefact-based reflection, which revolves around work-artefacts. The main idea is for knowl-

edge workers to "clean up their workplace" through reflecting about the work-artefacts they used throughout the day and any tasks related to them that they may have forgotten and are important for their future work. Through this process, the workers run a lower risk of these tasks lingering in their head during the evening and disrupting them in their leisure time. The reflections should be written down by the workers in order to free their mind as any open threads regarding their work are being stored outside of their thoughts. Additionally, the tasks originating out of the reflection should be noted as goals for the next day, which enables workers to detach themselves more efficiently from work, since they can now enjoy their leisure time without being interrupted by work-related thoughts.

We implemented this new concept in an application called *Downtime*, which introduces its users to two rituals they can perform at the start and at the end of their workday, similar to the *Shutdown Helper*. Additionally, within the rituals the users are encouraged to reflect on their workday by going through their open tabs and storing the ones that are important for the future in *Downtime* itself, scanning the files they used that day, or checking their open e-mails to see if any of them need to be addressed the next day. The goal of *Downtime* is to help knowledge workers in creating boundaries between their work and non-work lives and facilitate detachment from their work, so that they can enjoy their leisure time without work-related thoughts.

Within the scope of this thesis we wanted to answer three research question around the topic of psychological detachment, *Downtime* and its effects on knowledge workers:

RQ1: What strategies do knowledge workers use to psychologically detach themselves from work?

RQ2: In what way are users of *Downtime* experiencing psychological detachment from work through the use of the application in the morning and the evening?

RQ3: How are the different components of downtime contributing to psychological detachment from work?

To evaluate our approach and answer these RQs, we conducted a two week long user study, where four participants were able to use *Downtime* and perform the rituals on a daily basis. At the end of the study we conducted a semi-structured interview with each one of them, where we asked them questions about their previous experiences with detaching and their experiences with the application and its effect on their level of detachment.

With the data collected during the study and from the interviews we were able to show that an approach to facilitate psychological detachment around the concept of artefact-based reflection enables knowledge workers to create boundaries between their work and leisure time. The application was especially effective when used by people who did not actively pursue routines to detach themselves from work prior. Reflecting on the work-artefacts they used that day and "cleaning their workplace" helped them in enjoying their evening without work-related thoughts.

In the chapter "Related Work", we presented previous work revolving around the concept of psychological detachment, its effects on knowledge workers and how to facilitate it. Additionally, we reviewed studies which aimed at facilitating detachment from work through the use of different applications. With the knowledge gained from this research we developed *Downtime* and its features, which we presented in the chapter "Approach" along with detailed description of how the application works. The following chapter "Method" explains how the user study was set up

and how we collected the data. The outcome of the user study is then presented in the chapter "Results", which contains the relevant quantitative and qualitative data we gathered. The chapter "Discussion" expounds the answers to our research questions along with the most prominent findings of our analysis. Finally, in the chapter "Conclusion" we summarize the important outcomes of our research, take a critical look at our study and place our contribution in the already existing research about psychological detachment.

Chapter 2

Related Work

In the following section, the concept of psychological detachment will be explained in depth. In regards to knowledge workers, it will be shown why detachment falls short in general and which negative effects exist for workers. Additionally, it will also be clarified by which aspects detachment is influenced. These aspects include Goal-Setting Theory, the concept of reflection and work-artefact based interventions. In the end, existing approaches to the problem of psychological detachment for knowledge workers will be presented.

2.1 Psychological detachment

The concept of psychological detachment has been explored by many researchers in the past. It revolves around not being occupied by thoughts about work while not being at work, a "sense of being away from the work situation" [EEL98]. It not only refers to not having thoughts about work, but also to not being involved in work-related activities, such as phone calls, e-mails or other work-related tasks [SF07]. It is therefore an experience of "switching off" from work [Son11] or a state in which people mentally disconnect from work [Son12]. This does by all means not suggest that being psychologically detached implies a generally detached attitude toward one's job [Son12]. The dedication of people towards there job has no correlation to their level of detachment [KSW09]. Altogether psychological detachment is facilitated by experiencing no work-related feelings or thoughts while not being at work through mentally distancing oneself from work during non-work time [FYZB10].

Knowledge workers are individuals whose main capital while working is information. These workers earn their living with brainpower rather than muscle power [Kid94, Mlá11]. Knowledge work occupations include students, office workers and managers in general [Kol22]. Over the past decades, so called information and communication technologies have become more and more important for knowledge workers [MBM22]. While the work with ICTs brings advantages with itself, such as the possibility to work from any location in the world [Kol22], the negative effects must not be neglected. The ICT availability is associated with a constant pressure to be online, including leisure time. This can lead to decreased well-being, lower job performance and higher dissatisfaction [DM12, MBM22].

2.2 Impact of psychological detachment

The level of psychological detachment an individual experiences can influence a lot of factors both in the area of work or leisure time. First of all psychological detachment during non-work time is important for recovery, well-being and health in general [HSMNK21, PFJ11, SBM10, WLH17]. A lack of detachment can lead to reduced well-being, higher fatigue, and high strain levels [HSMNK21, Son11]. These negative effects can even turn into burnouts and generally low life satisfaction [SF15]. While the negative effects mentioned so far refer to the personal lives of individuals, effects that concern the work life have also been discovered. A high level of detachment can also promote job performance and work engagement, which in turn leads to more life satisfaction [SBM10, Son12, WKM+18]. It is important to note, that while experiencing more detachment from work leads to fewer symptoms of psychological strain, there is no correlation to being less engaged at work [Son12]. Work engagement is therefore only negatively correlated to detachment. A connection between certain personal characteristics and detachment has also been found. For example, neuroticism and heavy work investment have a negative correlation with psychological detachment [WLH17]. Lastly, there are also long-term effects of a lack of psychological detachment. It was shown that emotional exhaustion was negatively correlated to detachment over a time span of one year [SBM10].

2.3 How psychological detachment is facilitated

Psychological detachment can be managed through many different factors, which have been discovered over the years. These factors are mainly rooted in the work life of an individual. Being pressured at work to prioritise work over personal life, high time pressure, work overload and working overtime were proven to decrease psychological detachment [HSMNK21, SB05, SF15]. Also a high involvement in ones job and poor environmental conditions at the work place can hinder an individual in leaving work behind during leisure time [Son12]. There are also ways of facilitating a high level of detachment at work. The concept of mindfulness experiences states that employees high on mindfulness display constant high levels of detachment [HLD+14]. Mindfulness itself involves intentionally bringing one's attention to the internal and external experiences occurring in the present moment [Bae03]. Additionally, psychological detachment can be facilitated from home. It was shown, that using less technology at home is associated with higher psychological detachment. Also creating boundaries between work and non-work lives can help individuals with detaching from work [PFJ11].

The concept of psychological detachment also overlaps with other concepts such as work-reflections [MCD16]. Reflections in general describe actions that help in exploring experiences in order to gain new understanding and appreciation [BKW13]. Self-reflection was studied as a facilitator for well-being on multiple occasions and were shown to reduce negative mood [MCD16]. In a study about developers it was found that continuous self-reflection increased the awareness of the participants about productive and unproductive work habits and fosters positive self-improvements which lead to an increase in productivity and well-being [MMZF19]. Another study [FS05] was able to show that the absence of positive work reflection during the weekend, among other factors, predicted burnouts and decreased well-being after the weekend. In contrast, reflecting positively about the job had a positive effect on exhaustion and disengagement, therefore lowering the chance of a burnout. Besides that, positive work reflections encouraged participants to learn something new at work [FS05].

Another way to facilitate satisfaction in the workplace is Goal-setting theory [Lat04]. The core statement of Goal-setting theory is that an individual's conscious goals affect their achievements. A goal is the object or aim of an action, for example to complete a specific assignment within a specified time frame. Setting goals improves an individual's performance and setting explicit and harder goals for themselves can lead to better performance than setting vague or easy goals. Finally a goal is a standard for assessing an individual's satisfaction, meaning the more goals one achieves the more satisfied they feel [Lat04].

2.3.1 Digital Pieces of Information and Detachment

Several concepts have been brought forward by many researchers that refer to tidying up a work device during and after work, to promote various aspects in an individuals work and private life. Specifically, it has been researched how browsers, tabs and e-mails are handled by workers and multiple suggestions on how to handle these digital pieces of information, referred to as work-artefacts in the following, the most effectively have been put forward.

Visual clutter refers to the state in which excess items, or their representation or organization, lead to a degradation of performance at some task and to greater difficulties in performing visual search [RLN07]. A more specific type of cluttering, browser cluttering, refers to cluttered experiences of users due to disorganized browser elements and information. This phenomenon comes in several forms, most importantly for our work in the number of open tabs and browser windows. A study was able to show that users felt discomfort about the number of tabs, had difficulties in navigating web pages and got lost in searching specific information, because of cluttered browser [MLNL23]. However, the study only focused on the origins of browser cluttering and its effects and not on solutions for it. Similarly, the concept of tab overload refers to the issues that users face, when managing their tabs due to the increase in complexity and scope of online tasks. This leads to users losing focus and getting distracted by the sheer amount of tabs that compete for their attention. A study suggested new designs for browsers to better support tab management and help users in staying focused on their tasks [CHK+21].

A second important piece of digital information are files and folders. Navigating folders is the principle way that users retrieve their own files, which is why they dedicate a considerable amount of time to creating systematic structures to facilitate such retrievals. It has been found out that retrieval time and success depend on the size and depth of folder structures, suggesting that keeping folders light and folder structures shallow is the main way to decrease the time it takes to find a specific file [BWS+10]. The ubiquitous and challenging task of file management has also been highlighted in a study by [DJ20].

Lastly, a study was able to illustrate the effect of increasing volumes of e-mail in the workplace [BMG11]. Through the use of ICTs the e-mails get stored in the recipients inbox until they handled them, which means that e-mails can be sent at any time of the day ostensibly without disturbing the recipient. Depending on the workflow of individuals, this can lead to an immense build up of the amount of e-mails in ones inbox. Especially people who work in different time zones or are occupied with meetings the whole day, wake up or come back to their laptop only to find swollen inboxes, which only reminds them of how overloaded with work they are. Although workers can flexibly decide when to write or answer e-mails, they are regarded as a growing source of stress. The more time they spend on handling e-mails, the greater is the sense of being overloaded. This can lead to workers extending their workdays, handling e-mails at home or at the weekend, as a measure to regain control of their inbox [BMG11]. As shown, working overtime can be a source of decreased psychological detachment.

2.3.2 Creating Work-Home Boundaries

Boundary Theory is about transitions between different roles that an individual assumes throughout the workday. These role transitions involve home, work, and other places. Transitions are boundary-crossing activities, where one exits a role and enters another one. If two roles are more segmented the transition becomes more difficult but the roles are also less blurred together. A high integration of roles yields less effort when transitioning between them, but increases the blurring of those two roles [AKF00]. The transitions can be executed via boundary work tactics that individuals utilize to help in creating their own, suitable work-home segmentation or integration [KHS09].

The segmentation or integration of an individuals work and non-work roles also has effects on psychological detachment. A high work-life integration was shown to lead to more exhaustion and having less work-life balance. People with a high integration also reported to pursue less recovery activities which in return led to even more exhaustion and less balance. This indirect effect of a high integration via recovery activities has a much more grave impact on exhaustion and balance than the direct effect [WAB+18]. Another benefit of a segmentation of work and non-work roles is that it facilitates and lower barrier for reattaching to work in the morning. Reattachment, meaning to rebuild a mental connection to work before starting it, is an important factor to boost an individuals engagement at work [SEFK20].

2.4 Existing technological interventions

A few notable interventions to facilitate psychological detachment have been introduced already and four of them will be presented in the following.

SwitchBot is an approach presented by [WKM+18]. This conversational bot aims at helping knowledge workers to detach and reattach to work, through structured dialogues on either individuals' work-related tasks or emotions. The results of an in-situ study showed that workers using the application sent fewer e-mails after work hours and spent a larger percentage of their first hour at work using productivity tools, suggesting that their detachment was in fact increased. It was also found that the dialogues around work-related emotions facilitated higher productivity [WKM+18]. *TimeAware* suggests a different approach to promote productivity through a self-monitoring system, which helps in capturing and reflecting on personal computer usage behaviors. They were able to show that by emphasizing distracting activities a users productivity was increased. In general, the approach helped sustain engagement and enhance self-awareness [KJC+16]. At last *Virtual Commute* is a feature of Microsoft Viva Insights, that tries to mentally prepare its users for the end of the workday during their commute home. By following certain steps regarding their meetings, tasks and also reflections on their day the users should be able to wind down to help transition to the next part of the day [Mic].

The *Shutdown Helper* is a desktop application that assists users in performing a shutdown ritual at the end of their workday. They main goal is to create an active transition from work to life domains. The ritual is comprised of eight steps, which include the creation of a task list, checking the calendar, meditating and writing down an evening resolution among other things. This approach demonstrated the potential of an end-of-the-day routine for detachment from work. The application was tested in a user study and feedback was overall positive. The results showed that the use of the *Shutdown Helper* does indeed help the users to detach more effectively from work. Not all steps of the ritual turned out to be equally useful, with the task list being the most crucial

part for the participants. The other steps were reported to be only moderately practical for the participants [Kol22].

The *Shutdown Helper* is the most closely related to the approach presented in this thesis, as both application make use of rituals at the end of a workday. Nevertheless, the *Shutdown Helper*, as the other previously mentioned interventions, leave work-artefacts out of their process to facilitate detachment. By including them and evaluating their effect on detachment, we add a new field of research to this already existing literature.

Chapter 3

Approach

In the previous chapter we highlighted the importance of psychological detachment from work and the various effects it can have on individuals and their work-life balance. We also showed that not many solutions for knowledge workers have been introduced to facilitate psychological detachment. Therefore, we suggest a new approach based on an application, which we have tested in a user study. The details and structure of said approach are explained below.

3.1 Concepts

The application developed for this study, called *Downtime*, is based on three different concepts: Artefact-based reflection, Boundary theory (see 2.3.2) and Goal-setting theory (see 2.3). These concepts are briefly explained in the following.

Artefact-Based Reflection is a new concept introduced within this paper. It relies heavy on digital pieces of work and their effect on detachment as shown in section 2.3.1. The idea is to facilitate psychological detachment through "cleaning up ones workplace". At the end of a workday, knowledge workers have used many different work-artefacts, such as files, folder, tabs and e-mails. Instead of just shutting down their work device, workers should reflect on their workday through thinking about the work-artefacts they used throughout the day and any tasks coupled to them that are important for their future work. Through this, the workers free their mind, as any open threads regarding their work are being written down, and are able to detach themselves more efficiently from work, since they can now enjoy their leisure time without being interrupted by work-related thoughts.

The concept of Boundary theory is also applied in this study. Through the use of our application, the users create a boundary between their work life and personal life. Using *Downtime* acts as a phase of transition that helps to segment the two roles and reduce blurring effects between them. As shown, this helps in reducing exhaustion and promoting a healthy work-life balance. Additionally, *Downtime* also helps the users to reattach to their work more efficiently in the morning, which enhances their engagement at work.

The last concept integrated in our application is that of Goal-setting theory. *Downtime* enables users to create goals, which they want to achieve during their work and stores them within the application. Through meeting their goals and marking them as done in *Downtime*, the users can experience a sense of satisfaction and are able to assess their progress throughout the day. As shown, this can lead to increased work performances.

3.2 Prototype: *Downtime*

The developed application, called *Downtime*, revolves around a ritual to create a smooth, but clear transition between work and non-work which should increase knowledge worker's psychological detachment from work. To tackle this, the users of *Downtime* are introduced to a four-step evening ritual (see Table 3.1), which follows three main goals (see Table 3.2), that they can perform each time they finish work for the day. Additionally, they should perform a morning ritual, comprised of only one step, to start their workday, which rounds up a full cycle of using *Downtime*. The evening ritual takes around five to ten minutes to complete while the morning ritual takes less than five minutes to complete.

Step 1:	Store or delete frequently used tabs of the day.
Step 2:	Save or delete downloaded files and desktop files.
Step 3:	Go through open mails and past meetings.
During Step 1-3:	Add goals and write down reflections.
Step 4:	Check goal list and reflection.

Table 3.1: The steps of the evening ritual in *Downtime*

Goal 1:	Be mentally prepared for non-work time.
Goal 2:	Free your mind through reflecting on workday.
Goal 3:	Save, important, work-related artefacts for the next day.

Table 3.2: The goals of the rituals in *Downtime*

Additionally, before each ritual users are prompted to answer a few questions on how relaxed or stressed they are, how much they thought about work since their last use of *Downtime* and if they worked after the evening ritual. These questions will be further explained in section 4.3.

Downtime is designed as a desktop-only application because it tracks websites the user visited during the day and retrieves the users download and desktop folder at the end of the day, which is why it needs access to the browser on the user's laptop or computer. Also, it encourages the user to finish their workday right on their work device, without having to switch for example to their mobile phone and thus delaying the ritual to a time when they already finished work and closed their work device. In order to prevent users of forgetting to complete their rituals, *Downtime* sends a push notification at 08:00 o'clock in the morning and 17:00 o'clock in the evening to remind them to use the application. Due to time constraints during development the notification times are not customizable.

3.2.1 Evening Ritual

The first goal is to be mentally prepared for non-work time. Throughout the ritual the user collects work-related to-dos that they can store in the application for the next day so that they do not have to keep them in mind. By writing these to-dos down, the users can decrease their work-related thoughts in the evening, because all important tasks and thoughts have been stored

in the application. In *Downtime* the to-dos are referred to as goals and not tasks, since goals are something one wants to do and tasks are something one has to do. This labelling should subconsciously lead to positive thoughts about work, such that users can take these thoughts with them and set themselves up for a positive evening. While creating the goal list, the user pursues the second goal of the rituals, which is to free their mind through reflecting on their workday in each of the four steps, since, as shown in [MMZF19], self-reflection can enhance well-being at work. The users are presented with work-artefacts such as files or tabs and are encouraged to "clean their work device" by either deleting them or storing them in *Downtime* and reflect on their workday during that process. Additionally, they are prompted to check their e-mails for any open tasks connected to them and write them down, and reflect on their meetings of the day and create goals for any open issues related to them. These steps set them up for an evening free of work-related thoughts as they already checked and updated their open tasks for the next day.

Step One: Browser Clean Up

In the first three steps of the evening ritual the user is presented with various opportunities to clean up their workplace. Firstly, to prevent browser cluttering [MLNL23] and avoid distractions [CHK+21], a list of all currently open tabs and tabs they frequently visited throughout the day is shown to the users (see Figure 3.1) and they are able to save these within *Downtime*, should they decide that a tab is relevant to them in the future. Otherwise they can delete those tabs via *Downtime*, which, if they are still open in the browser, also closes the tab on their work device. With frequently visited tabs, all tabs are meant, that were visited more than four times throughout the day. When visiting a site, refreshing it or refocusing the tab, the counter for that specific tab was increased by one. Time spent on the website was not considered for this feature. Additionally, these tabs can be linked to a goal, so that the user does not have to remember that they, for example, have already looked up some websites they need for some research they are conducting at the moment.

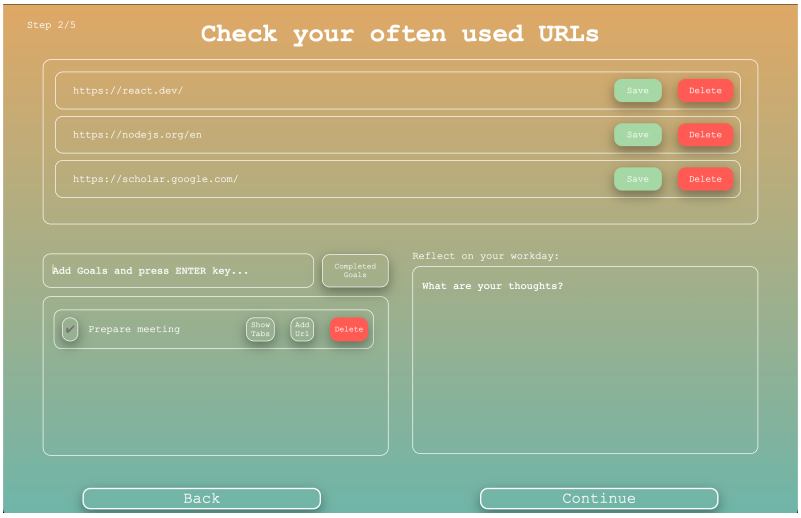

Figure 3.1: Step one of the evening ritual of *Downtime*

Step Two: File Management

In the second step of the ritual the user is shown a list of all files they either downloaded that day or currently have stored on their desktop (see Figure 3.2). The user can delete all files they do not have a use for anymore or properly save them in their folder structure. On MacOS for example, screenshots are being stored on the desktop automatically. This can lead to a very cluttered desktop if one forgets to delete them after using them. With this feature in *Downtime*, they are reminded of any unnecessary files that are still floating around on their desktop. With this step *Downtime* supports active file management, one of the central activities in using a computer [DJ20]. Deleting unnecessary files and moving files to better suited locations, leads to less visual clutter in the respective folders, which is beneficial for work performance [RLN07].

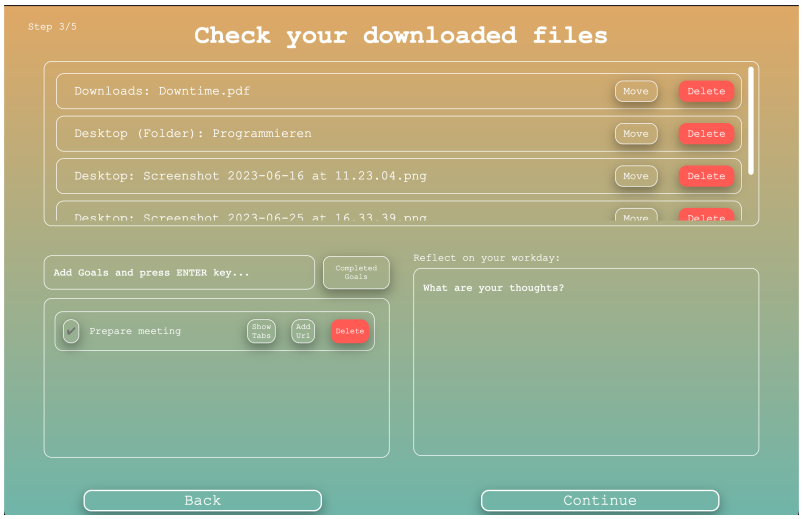

Figure 3.2: Step two of the evening ritual of *Downtime*

Step Three: Keeping Track of Mails and Calendar

In the third step the user can open e-mail or calendar applications through *Downtime*, such as Outlook or Apple Mail, and is encouraged to tidy up their inbox, delete answered mails or write down any goals regarding mails or meetings for tomorrow (see Figure 3.3). The goal is not to answer all e-mails that still need to be attended to, as this could cause a sense of being overloaded [BMG11], but to free their own mind by reflecting on the meetings and e-mails of that day and writing down goals in *Downtime*, that originated out of these interactions. For example, if an e-mail arrives late during the workday, the users notice this during this step of the ritual and can set themselves a goal for the next day to answer that e-mail. This way, they do not having to think about work anymore in the evening, since all important thoughts are stored in the application.

With these three steps the user can save important, work-related artefacts for the next day (third goal) and further free up mental capacity for their free time.

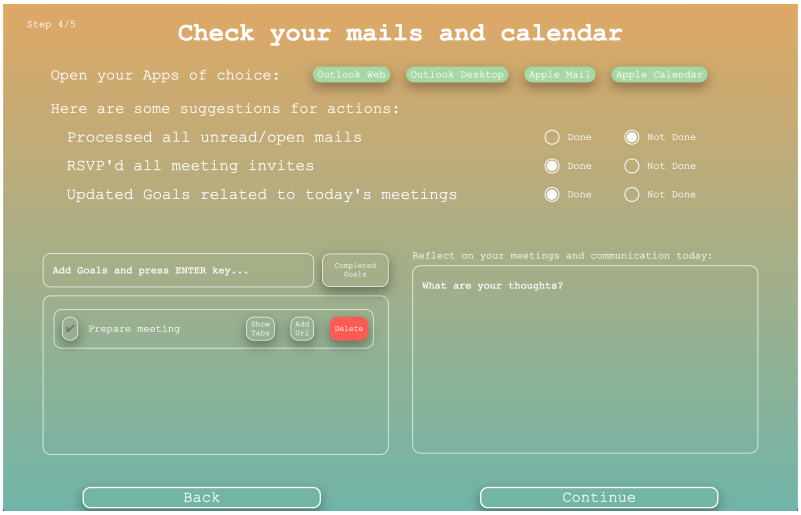

Figure 3.3: Step three of the evening ritual of *Downtime*

Step Four: Revisit Goal List and Reflection

The fourth step of the ritual presents the goal list and written reflections of the current ritual to the user for any last additions or changes (see Figure 3.4), for example they could notice that an open goal in their list is actually already completed and therefore can be marked as such. Since this is the last act of a workday, the user is encouraged to take one last look at their workday and everything they have achieved. They should write down their last thoughts about the day and proceed to finish the ritual and close their device.

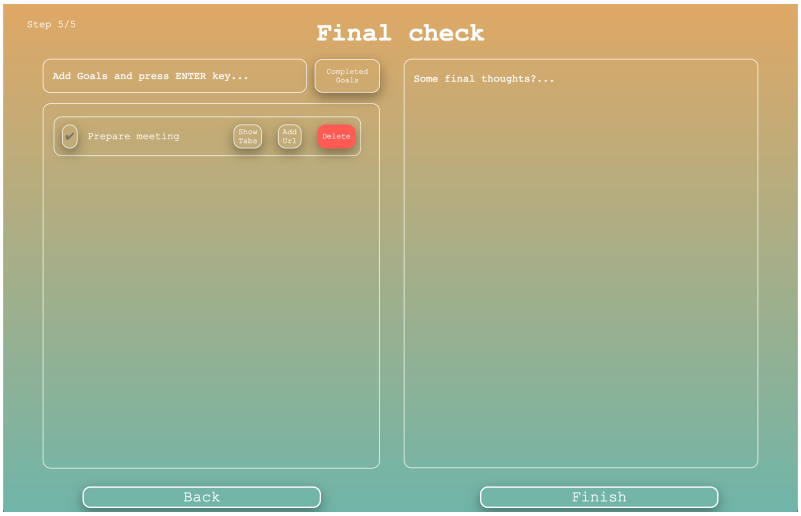

Figure 3.4: Step four of the evening ritual of *Downtime*

3.2.2 Morning Ritual

The morning ritual only includes one step which is to review the goal list, add or delete any goals if necessary and open any relevant tabs, if they are connected to a goal the user wants to start with (see Figure 3.5). Therefore, the user is simply presented with the current goal list that they have created the previous day. This step is kept short intentionally and should solely help the user to reattach to their work in the morning in the quickest way possible. Should the user decide to check up on their goal list throughout their day, *Downtime* also has an option to only view ones goals without having to start a ritual. Additionally, users can at any time view their past reflections. This allows them to review for example their thoughts on the past week, which could lead to insights on their mental state over a longer period of time.

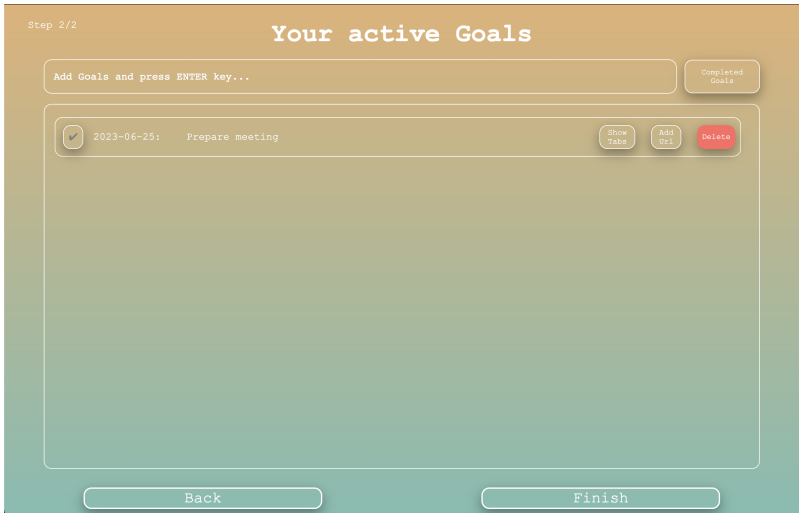

Figure 3.5: The morning ritual of *Downtime*

3.3 User Flow

For a better understanding of how *Downtime* works, an example of a typical user scenario is explained in the following.

Once the user is finished with their workday, they open the application and are presented with the home page. From here they can begin the evening ritual. At first, they are given a list with all frequently used websites from their workday. As they do not intend to revisit a few of them they delete the respective entries and save a couple they know they need the following day for some further research. They also update their goals and link one of the saved tabs with the newly created goal, as the website is their main source of information to tackle said goal. They also start reflecting on their workday and write down a few sentences.

Next, they see a list of their downloaded files from that day. They also notice that there are still a few screenshots on their desktop that they took during the day. They delete the screenshots and move the downloaded files in more adequate folders in their system. As no new goals originate from this section they continue after adding a couple of remarks to their reflection. In the next

screen they are encouraged to scan their Outlook mail and calendar. They notice an e-mail that arrived late and create a goal to answer it the following day. In their calendar they notice an important meeting set on the next day and create another goal to prepare the meeting accordingly. After deleting some spam mail they close Outlook and continue the ritual. In the final screen they check their goal list, mark one goal as completed, and add some final thoughts to their reflection. In the end, they finish the evening ritual and close the app.

The following day, they open up *Downtime* first thing in the morning and start their workday. They can review their goal list and open the website they connected to one of their goals the previous day, which reattaches them quickly to their work. Finally, they finish the morning ritual, close *Downtime*, and fully focus on their workday.

Chapter 4

Method

To evaluate *Downtime* and the rituals within the application, a user study was conducted. With this study we wanted to find out about the effects of the rituals and it's features on knowledge workers and their psychological detachment from work. The insights gained should help to further develop the application and enhance the rituals.

4.1 User Study Procedure

The user study took place over a course of two weeks during which the participants used the application in the morning and evening and incorporated the rituals into their daily work life. The weekend prior to the study each participant got access to the application, the browser extension, a form of consent (see Appendix A) and a user study guide (see Appendix B). This way they were able to download the application and make themselves familiar with the process before the study started. All the instruction about the setup and the installation of the browser extension were written down in the user study guide, as well as how to use *Downtime* during the time of the study. The participants were instructed to use *Downtime* two times per day during the study and follow the rituals at each occasion, creating their goal list, reflecting on their workday via revisiting the relevant work-artefacts and answering questions about their level of stress and detachment. At the end of the two weeks the participants sent the collected data (further specified in section 4.3) to us and took part in a semi-structured interview where they answered questions about their experiences with psychological detachment before, during and after the study, their thoughts on the application and the way of using *Downtime* and performing the rituals. The data was collected anonymously and the databases were deleted after the analysis.

The interviews were conducted via a Microsoft Teams call in a one-to-one fashion. All of the participants agreed to being recorded and the resulting audio file to be transcribed for research purposes. The audio files were deleted once they were transcribed, and the transcriptions were deleted once the relevant data was extracted from them.

4.2 Participants

For the user study we recruited four participants through our own personal network. The inclusion criteria involved being classified as a knowledge worker, working or studying during the two weeks of the study, using Mac OS and Firefox and being able to download the application

to their own personal laptop. Two of the participants were full-time students in the areas of computer science, one participant studied law while also working part-time and one participant worked 80 percent in a software development company. All the participants that studied used the application every day of the study, while the last participant only used *Downtime* during their four days of working. Three of the participants identify as male, the fourth as female and their ages range from 22 to 28 with an average of 24.

4.3 Data Collection

During the user study, *Downtime* recorded the user interactions of the participants with the application. For example, when the participants completed a ritual, if they saved a tab, deleted a downloaded file, or opened their calendar app, a message was sent by *Downtime* to the local database and a respective counter recorded the action. The goal of collecting this quantitative data was to gain insights on how the participants interact with the application and how often each individual feature was used.

Additionally, before a participant started the morning or evening ritual, they had to answer a few questions regarding their mental state. Before they were able to start the evening ritual, they answered a question about how relaxed they felt during their workday on a seven-point Likert scale. In the morning they were asked how much they thought about work since their last work session (seven-point Likert scale), how stressed they felt since their last time using *Downtime* (seven-point Likert scale) and if they worked even after completing the evening ritual the last time they used *Downtime*. If they did, they were asked about details of what kind of additional work they performed. With these questions, the goal was to understand how the mental state of the participants changed or remained consistent during the two weeks of the user study. By tracking their level of stress and detachment via self-rating, we aimed at gaining knowledge about the effects *Downtime* has on its users.

Lastly, the participants took part in a semi-structured interview, where we asked them open-ended question about their experience with the application and the user study as well as their behavior regarding detachment previous to the study and during the study. The qualitative data raised in these interviews expanded our knowledge about how *Downtime* was used in a way that simple numbers are not able to. Due to the semi-structure of the interviews, additional, in-depth questions could be asked, if needed, to collect more details about the experiences of the participants. The questions from the Interview are completely listed in Appendix C.

4.4 Data Analysis

Both the quantitative data from the database and the qualitative data from the semi-structured interview were used in combination for the data analysis. The qualitative data consisted of the transcribed audio files and was further analysed through a thematic analysis using a six-phase approach [BC12]. The first phase was to familiarize ourselves with the data, which already happened in the transcription process. Next, we generated initial codes throughout all the interviews. A code is an identity or label for a piece of information that is potentially relevant for the analysis. In a third step all codes got sorted into themes, which offer a high-level summary of multiple codes. These themes were then specified and relabeled in an iterative process to ensure they were applied in the best way possible. This also includes creating sub-themes, if multiple themes seem

similar and describe a set of codes from the same category. In the last step the themes, sub-themes and codes were combined with the quantitative data [BC12].

Because of the sample size being rather small, it is unlikely that the analysis does yield statistically significant results. However, since both the qualitative and the quantitative data sets are collected from the same participant respectively, the quantitative data can be used to evaluate if the participant's behavior in *Downtime* corresponds with their statements from the interviews. The outcome of this analysis is presented in the following chapter.

Chapter 5

Results

In the following chapter we will present the results from the analysis of the quantitative and qualitative data. Through this data we will learn what strategies knowledge workers use to psychologically detach themselves, in what way *Downtime* contributes to their sense of detachment and how the different components of the application are being perceived in their ability to facilitate detachment.

Three participants would have been able to perform the morning and evening ritual ten times each over the two week long study. P1 would have been able to perform the rituals only eight times each, since they work part time. In total 66/76 rituals (34 in the morning and 32 in the evening) were performed and the generated data was used for the quantitative data analysis (see Table 5.1). The qualitative data extended these findings and produced valuable insights into the thinking of the participants.

	Total	Average per user per day	Standard deviation (s.d.)
Goals created	116	3.6	24.1
Reflections written	18	0.56	2.9
Files recorded	286	8.9	45.2
Tabs recorded	285	8.8	46.7
Mails checked	27	0.5	1.3

Table 5.1: Average usages of the features of Downtime

5.1 Strategies for psychological detachment used by knowledge worker (RQ1)

The insights from the semi-structured interviews generated the findings for the first research question, as the participants were asked about their experiences with stress and psychological detachment before the study.

5.1.1 Pursuing detachment

The concept of detachment is not widely known. All of the participants stated that they have never thought about actively detaching from their work, with P2, P3 and P4 highlighting their previous experiences with detaching.

> *"I didn't really detach from work in a way that I could put away all the thoughts about work."* - P2

> *"I'll just open a new tab and do not detach from the thing I was doing before."* - P3

> *"Usually, I don't feel very detached from work especially when I'm not planning good."* - P4

P1 was the only participant who didn't have any problems with not thinking about their workday in the evening.

> *"So, I usually never have trouble with thinking too much about work during my off time."* - P1

People seek detachment subconsciously. Although none of the participants were familiar with the concept of detaching, they revealed that there are certain actions they undertake to think less about work in the evening, although not consciously. P1 already made a connection to *Downtime* at this stage of the interview and said, that they clean their browser and close applications at the end of their workday, although not with the intention of detaching. Apart from that there seem to be some ways for the participants to get rid of their thoughts about work, like going out with friends or doing sports. Nevertheless, none of the participants actively performed a ritual at the end of their workday to psychologically detach themselves from their work.

> *"Not really that specifically. I mean I usually, and this probably already ties in a little bit into my usage of Downtime, I usually clean up my browser tabs and I switch off the integrated development environment and things like that."* - P1

> *"Only if I went out with friends then I would really like to put the thoughts away, focus on other things. But else I never really detached from work."* - P2

> *"Like also with my mind, I'm not really actively detaching. I'm just saying OK I'm done but there's nothing else I do."* - P3

> *"But I'm doing sports, I guess this is free time. But I'm not really detaching work from free time usually so I'm mixing it all up together."* - P4

5.1.2 Differences in working from home and on site

Working on site is not necessarily better for detachment. When asked about the influence on their level of detachment when working from home or not, a clear distinction can be made

between the students and the employee. While all the students expressed greater difficulties in concentrating, avoiding distractions and thus creating detachment when working from home, P1 stated that working from home makes it easier for them to detach, as they do not see the commute from their workplace home as a time to detach. Contrarily, P3 specifically declared the commute as a benefit when not working from home, as it serves them as a transition phase between the two roles.

> *"I would say it actually takes longer for me to detach when I work in the office just because I take the train home and that takes some time and during that time I cannot fully detach yet."* - P1

> *"I think like on the way home, the commute, I really used that time to distance myself from the learning stuff, so I just normally solve a crossword puzzle on my phone or in the newspaper."* - P3

5.1.3 Perception of stress

High time pressure leads to the most stress. As shown, stress at the workplace in the form of work overload, high time pressure or working overtime can have negative impacts on detachment, which is why we wanted gain insights on stress and where it is coming from in the interviews. The qualitative data revealed that the participants perceive stress often in the same way, with times of less stress and times where their stress level is peaking. When asked about where that stress might come from, high time pressure and not enough planning stood out as reasons.

> *"It's mostly I would say high time pressure."* - P1

> *"I think it was mostly produced by approaching deadlines because I'm a person that tends to postpone work until it's near to due date."* - P2

> *"[...] like I'm not a very planned learner and this gets me into a lot of stress usually."* - P4

Stress from outside versus inside. P1 also stated that they get into phases of high time pressure when they are being allocated to different projects and have to act as a "clean up crew". They suggest that their stress is often induced from outside, while the other participants stated that they get themselves into phases of high time pressure by not planning enough ahead or procrastinating. P3, a part time student who works 20 percent faces stress only during their study time, while their job is not that stressful.

5.2 Experiences with detachment through the use of *Downtime* (RQ2)

In this section the data gained from the quantitative analysis was combined with the data gained from the interviews to answer the question of how the participants experienced psychological detachment through the use of *Downtime*.

5.2.1 Effects on stress through *Downtime*

Different outcomes on the level of stress. Three of the four participants revealed during the interview, that they felt more stressed during the time of the study than before. They stated that the upcoming exams at the end of the semester caused this effect.

> *"I felt more stressed during the study than before."* - P2
>
> *"[I felt more stressed than before the study.] Just from like university because I have exams coming up. So, it's just a lot going on."* - P3
>
> *"I think I was very stressed because it's close to the exams. Now I have a few days left and the closer it gets the more stress I get. "* - P4

Only P1 stated that the felt less stress during the study, but did not trace this back to *Downtime* but to their situation at work. In this case, *Downtime* didn't seem to have a effect on the participant.

> *"I think I was a bit less stressed than before. Mainly because I switched projects again and there was a bit less time pressure in the new project."* - P1

The quantitative data revealed that three out of the four participants felt more stressed on average over the course of the study (see Figure 5.1). For P2 and P4 this goes in line with their statements from above, that they felt more stressed due upcoming exams. Only P3 felt decreasingly stressed during the study, but stated that the upcoming exams would also make them feel more stressed in general. This could point to a positive short term effect that *Downtime* had on one participant during the two weeks, but must be discussed in more detail (see Chapter 6).

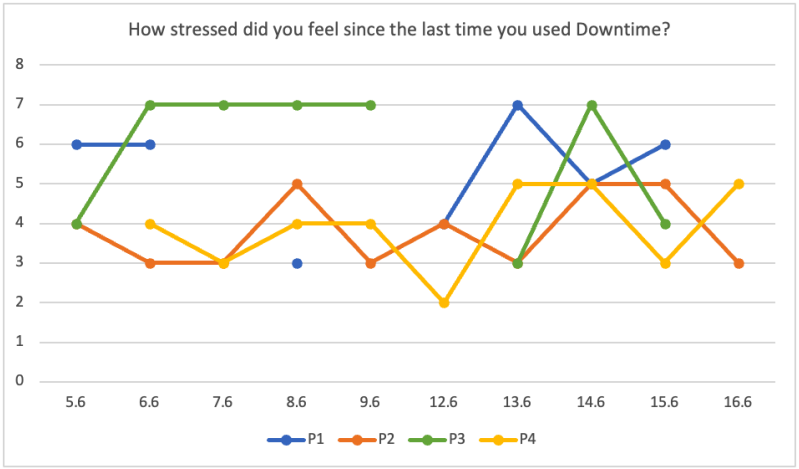

Figure 5.1: Level of stress the participants reported during the study

5.2.2 Effects on detachment through *Downtime*

Participants started to think less about work in the evening during the study. In terms of the level of detachment experienced by the participants, a similar outcome as described above can be observed. Three out of the four participants felt increasingly detached on average over the course of the study through thinking less about work during non-work time (see Figure 5.2).

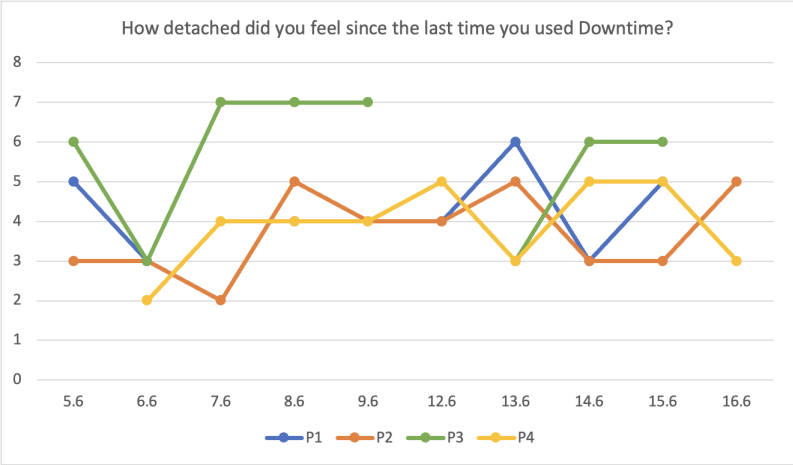

Figure 5.2: Level of detachment the participants reported during the study

Looking at the qualitative data from the interviews, it becomes more clear that *Downtime* had a positive effect on the participants level of detachment. The students all reported feeling a difference during their evenings, which they trace back to the application. When asked how detached from work they were during the study, the participants reported:

> *"I would say about the same as normal."* - P1
>
> *"I definitely have felt the difference coming from that ritual that you do in the end of the day and close everything up."* - P2
>
> *"I think just doing that [the ritual] gave me some time, distance as well. And this just helped with detaching."* - P3
>
> *"I guess I'm more detached than back in the days so before the study."* - P4

Relationship between stress and detachment. When combining the quantitative data about the level of stress with the data about the level of detachment it can be observed that P1, P2 and P4 noticed an increase in their level of stress on average (see Table 5.1) combined with an increase in their level of detachment on average (see Table 5.2) over the course of the study. Only P3 felt decreasingly stressed and also decreasingly detached. This findings go against the results of previous literature, which states that more stress leads to less detachment [HSMNK21,SB05,SF15] and needs further evaluation.

Relaxation and detachment do not seem to be correlated. Since the participants were also asked during the study how relaxed they were during a workday, another observation could be made. One could assume that if a user feels more relaxed during their work, their level of detachment should increase [HSMNK21, PFJ11, SBM10, WLH17]. This assumption could not be backed up with the collected quantitative data. With the level of relaxation during a workday, it was not possible to make a prediction about the participants level of detachment during the subsequent evening, meaning there was no clear, continuous correlation between the two reported numbers. Since not every participant performed every ritual, we were not able to present data about this for every day of the study, which is why we decided on a subset of days that represent the non-existing correlation (see Table 5.2). The first number represents the level of relaxation during the workday and the second number the level of detachment in the evening, as reported by the participants.

	12.6.23	13.6.23	14.6.23
P1	6 | 6	4 | 3	6 | 5
P2	6 | 4	3 | 6	5 | 3
P3	6 | 5	3 | 5	3 | 5
P4	2 | 3	5 | 5	4 | 3

Table 5.2: Relationship between relaxation and detachment

5.2.3 Difference in working hours

Students have less structured workdays. Since *Downtime* tracked the times of when the participants performed their evening rituals, another observation was made, which could be important for explaining their level of detachment. These times offer an additional insight into when the participants finished their workdays. As seen in Table 5.3, P1 was the only participant who finished their workday on a consistent basis in the afternoon. The other three participants, all of them studying at least 80 percent have much higher differences in when they finish their workday as well as finishing their workday significantly later than P1 in general.

	Average Time	Earliest Time	Latest Time
P1	15:41	15:26	15:51
P2	18:10	16:13	21:10
P3	18:37	14:46	21:28
P4	20:45	19:44	21:55

Table 5.3: Quantitative data of when the participants performed the evening ritual

A few statements from the participants suggest that these numbers have to be taken with a grain of salt. P2 stated that *Downtime* actually helped them to finish their workday earlier as usual and P3 forgot their evening rituals sometimes and made up for it later in the evening, despite being already finished with work.

> *"So, it was easier for me to wake up early in the morning because I detached from work the evening before and didn't work till eleven or twelve o'clock and instead could start working at eight o'clock then and finish work earlier than I usually do."* - P2

> *"And then sometimes with my evening practices [sports] it got mixed up and I had to do it after practice because I didn't have time before practice even though I was actually finished."* - P3

> *"Because like after I finished the ritual, I usually went to sleep directly so there wasn't that much time left. Sometimes I was on the phone for one hour after that."* - P4

5.3 Experiences with the different features of *Downtime* (RQ3)

The following sections summarizes the data collected in the analysis, to answer the question of how the different features of *Downtime* were perceived by the participants and what effect they had on the participants level of detachment. Additionally it will be outlined what the participants suggested as improvements for the app, to further understand their experiences during the study.

5.3.1 Feedback about the different features

Goals can be a valuable asset to structure the workday. The goals feature was the most used feature in *Downtime*, with 29 goals created on average (s.d.: 24.1) and 27 of them marked as completed on average (s.d.: 19.6) throughout the two weeks of the user study. As seen by the s.d., the distribution between the participants is heavily skewed. P4 created and completed the most goals with 7.5 and 6.3 respectively on average per day, while P1 created and completed 1.3 goals on average per day. Through the interviews it became apparent that the feature was differently perceived by the participants. P3 and P4 found the goals feature useful, because it helped them in structuring their day. P3 also mentioned that they enjoyed marking goals as completed, a feature that P4 established to be beneficial for them as well.

> *"And with Downtime I could like re-watch and revisit my completed goals which I really enjoyed because in moments of frustration you could actually see how much you already got done that day."* - P3

> *"I used it basically to set goals for the next or for the present day. And I also was using it to just write down some things to do in the future as well."* - P4

Writing down goals can also be a hindrance. P1 stated that they generally know their goals for a workday, but just never wrote them down, which is why the feature, although interesting, felt more like a burden to them. P2 made it clear that goals for them is not the right labelling, as it suggests a long term plan behind it. Apart from the labelling they did not have any criticism.

"It was interesting for me to think about them explicitly in the beginning of the day." - P1

"I had a little hard time with the goals as goals for me are very long term." - P2

Reflections help students with detachment. Writing down reflections was generally seen as the most useful feature of *Downtime*. Especially the participants who study thought of the process as very beneficial. Of the 18 reflections written, all were written by P2, P3, and P4, with an average of 0.75 reflections per participant per day when excluding P1 who didn't write any reflection. P1 stated that they see how it could be useful to them, but it just didn't fit into their workday, as they felt that their workday is simply finished in the evening and does not need to be reflected upon.

"Well, I didn't really feel like doing it. Because, I don't know, by the time I use Downtime again [in the evening] I'm done with the workday." -P1

"It was very pleasant I liked it a lot. Also, to have feedback on what I have done throughout the day." - P2

"I think it was really good also in regard of upcoming workdays." - P3

"It helped a lot. Especially to improve and what could have been done better for the next day." - P4

Keeping the folder clean can be beneficial. The participants had mixed feeling about the file management feature of *Downtime*, which can be seen through the usage numbers. On average 71.5 were shown to the participants, with 3.25 of them being moved to a different location on the system and 13.25 being deleted. P2 had the most interactions with this feature with 34, while P1 had the least with 2. The qualitative data adds to this narrative. P1 did not make any statements about the feature apart from that they did not really use it. Although P2 did not find the feature for cleaning the folders useful, they found appreciation in reflecting upon the files they used in a day, which gave them a sense of control. P3 and P4 used the feature to delete files, with P3 deleting ten files out of 53 that got presented to them and P4 deleting 13 out of 110.

"I didn't really feel a benefit of it. But what was interesting was that I also saw the downloads which also gave me a sense of what I did today or what topics I touched upon." - P2

"It was really good. As I told you before I usually store them right away and with that, I was just like OK I can also do it in the evening and not forget it." - P3

"So, for me it was kind of useful to delete downloaded folders and files. Especially the files. After I finish my work, I was able to delete them immediately." - P4

Previous workflows play an important role. When looking at the qualitative data regarding how the participants used to manage their files before using *Downtime*, these statements can be clarified further. P1 stated that they are already content with their way of managing files and thus

could not really use this feature. In the case of P2, it became apparent that although they already managed their files well, the found the intended use of this feature very beneficial. P3 also already had their own routines, but in this case P3 even changed their routine of handling their files, which they stated enabled them to focus more on the task at hand during the workday. P4 reported that especially their download folder was overfilled, which is why this feature worked well for them.

Managing tabs can ease the workload. The tabs feature was the least used feature throughout the study with participants saving 3.25 tabs in *Downtime* out of 71 recorded on average. Despite this lack of usage, two of the participants found it useful, especially for one specific task each. P2 and P4 combined accounted for 85 percent of all saved tabs and stated that accessing the tab in the morning via *Downtime* was very useful to them. P3 was indifferent to the feature, as they did not have to do any work where they might have to revisit certain websites. For P1 the feature was not able to replace their normal way of managing tabs.

> *"I mean maybe the cognitive effort is still mostly the same as looking at the browser in window and going through the tabs."* - P1

> *"I used it for only single tasks but not for every task."* - P2

> *"I just deleted all of them [via Downtime]. But maybe it's because I'm not actually working on a thesis."* - P3

> *"That helped a lot, but I guess this was the feature I used still not that much compared to the others."* - P4

Checking mails is already implemented in most workflows. The last feature of *Downtime* also got mixed feedback. The numbers from the quantitative analysis suggest that most of the participants either checked, processed or deleted their mails most of the evenings. The qualitative data supports these findings. P1 and P3 found the feature the least useful, since they already have their ways of checking up on their e-mails. P2 checks their e-mails every morning at the start of the workday, but found the implementation in *Downtime* still useful, since it reminded them of some open e-mails they should answer. Only P4 mentioned that the feature changed their original workflow, as they started to check their e-mails daily, through performing the evening ritual.

> *"I found it useful in a way that it reminded me of some open RSVPs and then I responded right now as they do usually don't take that much time."* - P2

> *"So, it was like, I didn't really need it that much because I knew I had answered all the mails already."* - P3

> *"So, I checked basically every evening and I would say that I deleted emails more frequently since I used Downtime."* - P4

5.3.2 Suggestions for the future of *Downtime*

The participants made several suggestions for improving *Downtime*, a few of which will be highlighted in the following.

Supporting the user through better user interface. P1 was confused sometimes if they had already done the morning ritual. They suggested a feature, which indicates to the user in which phase of their workday they currently are. P4 had wished for a button when revisiting the files in the evening ritual, with which a specific file could directly be opened in the Finder of the working device.

> *"[...] that the UI was not very, it was not very obvious which state you're in."* - P1

> *"Yes, I guess like the folder opening button would be interesting or the file opening button. Like that you could see what you are really deleting because like sometimes determining what you're deleting was difficult from just seeing the path."* - P4

Making the rituals customizable. Two participants stated that they would have wished for some features to not be included in the process. P3, for example, would have liked the reminder to check the mails in the morning as well, because it would allow them to reorganize their goals more efficiently. P2 stated that they would have liked to be able to toggle features on and off in general.

> *"With that at the beginning of the day you can already check on what happened or what mails you received. So, maybe you can reorganize your tasks accordingly."* - P3

Ordering lists makes them easier to read. Another feature that was suggested, was the ordering of lists. P1 would have liked it if the tabs would have been organized into different topics automatically, although they mentioned that integrating neural networks would have gone beyond the scope of the study. P4 on the other hand would have liked to order his goals either by importance or date.

> *"[...] from the URL and the page title maybe you could categorize the tabs automatically [...]."* - P1

> *"[...] it would also be interesting to structure the tasks a little bit you know. What I mean is that you have like an importance level, so the most important task."* - P4

Workers need to be remembered to perform the rituals. Two participants pointed out, that the notifications did not work as intended during the study, which led them to forget to perform the ritual from time to time. They either got them at the wrong time during the day or not at all. This feedback was noted by the researchers and declared as a bug in the implementation of the feature.

Chapter 6

Discussion

In the following sections the results highlighted in the previous chapter will be discussed in regard to the research questions. We will deep dive into the findings and draw conclusions from the analysed data. Further, the future of *Downtime* and the limitations of our approach will be discussed.

6.1 Discussion of the research questions

The presented data provides initial evidence that an approach to facilitate psychological detachment for knowledge workers through the help of a ritual relying on artefact-based reflection yields positive results.

Structured environments help in detaching. The students in the study were experiencing more problems with psychological detachment initially. They all stated that they do not feel a great level of detachment, which causes them stress, especially in exam phases or with deadlines approaching. Contrarily, the employed participant did not experience these problems in the same way. As a matter of fact, when it comes to artefact-based reflection, they were the only one who was already performing some sort of artefact-based ritual at the end of their workday, by going through their tabs and remembering the important ones for the next workday. It seems that with the experience one gains through working in a structured environment, they are able to create personalised work routines which they can subsequently benefit from. On the other hand, students who lack this experience and the structured environment are having trouble in creating boundaries between their work and non-work lives, which leads them to never fully switch off their work role. For them, *Downtime* is more useful and beneficial because it supports them in creating routines, to facilitate detachment.

Detachment is created subconsciously. It became clear that knowledge workers are not familiar with the concept of detachment, which can be rated as positive for the user study, since the participants were unbiased at the start. Despite not consciously knowing of the concept, knowledge workers do already undertake some actions to detach themselves from their work and to create boundaries between their work life and non-work life, for example, going out with friends, closing all tabs on their work device, or doing sports. These actions can already lead to a feeling of detachment, although subconsciously. In the interviews it became clear that performing a ritual to create detachment helped them in being more conscious about their level of detachment. Additionally, their subconscious ways of detaching themselves from work were still being followed

and posed an important part in their daily routine. A tool in the shape of *Downtime* can therefore able to support already existing ways of detaching even further.

Detaching on the commute. When it comes to the commute, the opinions are divided. For some participants the commute acted as a transition phase between two roles, while others couldn't start that transition until they were at home. Two participants also stated that just by going home, it does not mean that they are finished with work. This shows that the boundaries between work and non-work are subjectively perceived and created.

Rituals can facilitate detachment. The previous experiences of knowledge workers with detachment help in assessing the outcome of the study around *Downtime*. While students reported an increase in their level of detachment, the employee did not feel any difference in the level of detachment through the rituals. Taking into account that they, for example, did not reflect on their workday as the other participants did and that they additionally already had some sort of ritual in place where they closed and remembered their open tabs at the end of the day, this may not come as a surprise. On the other hand, the students who worked longer hours and had less boundaries between their work and non-work life in place, felt a positive effect from implementing the ritual in their work routine. All in all, if no previous end-of-the-day rituals are in place, a worker can feel an increase in psychological detachment from work through performing a ritual at the end of their day. If they already follow some sort of ritual, performing such a new routine can still add positive value to their experience with detachment. This was the case for P2 and P3, as they already had routines for their mails or files originally, but still reported that *Downtime* added value for them in those two areas.

Different experiences with *Downtime*. When looking at the positive feedback from the participants and the quantitative data from the application, we noticed that *Downtime* helps in facilitating detachment. This finding stands in line with the results from previous studies [Kol22]. Additionally, this effect was still relevant for two participants who felt increasingly stressed during the two weeks of the study. This shows that the introduction of a ritual to end the workday enables users to enjoy their evening even if their stress levels are rising, as they were for all of theses two participants. The data suggest that *Downtime* had a positive short-term effect on them, as they were increasingly detached despite being increasingly stressed. In the case of P3, the data has to be taken with caution as they stated in the interview that they felt increasingly detached from work during the study, but the quantitative data showed that they also thought more about work during non-work times throughout the study. This can either mean that they evaluated their level of detachment differently in retrospective or that they experience detachment not primarily through thinking less about work. Also the findings regarding P1 have to be taken with caution, as the quantitative data showed, that they were increasingly detached during the study, but stated in the interview that they felt less stressed overall in these two weeks because of their work situation. In this case *Downtime* may not be the cause for their increase in detachment, which ties in with the statements of P1, who said that the application was not as useful for them. The reason for that could well be their work routines regarding work-artefacts that they already had in place, which meant that *Downtime* might did not add new value for them in terms of end-of-the-day routines.

Reflecting on and creating goals for your workday supports detaching. Looking at the results it is possible to determine which features of *Downtime* contribute in what manner to the already established positive effect it has on detachment. Reflecting was perceived as the best feature overall, despite P1 not being interested in writing them. The other participants highlighted

their positive experiences in reflecting on their workday, especially since none of them have done so before. The goals feature of *Downtime* was the most used feature and perceived as useful especially, if the creation of daily goals was a routine that an individual has not performed so far. But also if the participants wrote down their goals before the study already, they perceived the feature as useful for their reflection in the evening, a result that can also be seen in previous research [Kol22].

Artefact-based reflection enhances detachment. In terms of artefact-based reflection multiple evaluations could be made. Reflecting on the files that one uses throughout the day was well received for users that did not manage their files before. But also for users, who already managed their files before, the feature was beneficial, as it enabled them to reflect upon their work through thinking about the files they used that day. In one case a participant even changed their work routine, because using *Downtime* fitted better into their workday. Reflecting on the tabs visited during a workday, on the other hand, was the least used feature and not as positively received. Saving tabs for the future was useful in some rare moments, and *Downtime* was often used to delete tabs through the application. It seems that most of the participants were indifferent about the feature because, while useful for very specific, they mostly just got presented with a list of tabs they did not have a use for anymore. Reflecting upon the mails was also to be found useful in some occasions, although checking ones mails was already heavily anchored in most work routines from the participants. Again, this shows that habits which are already in place are either not needed to be changed in order to create detachment or hard to change over the course of two weeks. Nevertheless, artefact-based reflection as a concept seemed to be well received and the approach taken in *Downtime* support the participants in facilitating detachment in various way.

6.2 Limitations of *Downtime*

It was shown that *Downtime* has the potential to facilitate psychological detachment for its users. However, a few limitations within the application and external factors may have lowered the level of success that could be observed. Within the application, it was apparent that the notifications which should have reminded the participants to perform the rituals did not work as intended. A few participants mentioned this and stated they might had performed the ritual more often if being remembered properly. Besides that, the application did not take any previous measure that participants had undertaken in their work routines into account. For example, if a participant already checked their e-mails on a daily basis at a certain time, they were still encouraged to do so again at the end of their workday. This might have led to negative thoughts about the application, since the participants were "forced" to adapt to *Downtime*. The issue of adapting became most apparent with the tabs feature. Because of time constraints during development, the application was only able to track tabs within Firefox. Some users therefore had to switch from their original browser to a new one in order to be eligible for the study. It has to be stated that the participants were made aware of that before the study and before agreeing to participate. Still, some stated that they had difficulties in adapting to a new browser, which might have hindered them in working as they are used to do. Thus, the results may have suffered from this.

When it comes to external factors, the usual working hours of the participant could have had a further effect on the outcome, as three of them tended to work late into the evening and thus having less time to detach from work before going to bed. Apart from one, the participants did not mention to have any problems with their late work hours, with one specifically stating that they changed their habit of working late through performing the ritual. The relationship between how much time one has to detach between the end of their workday and going to sleep and

how well they detach was not a central aspect of this thesis and thus needs more research to be uncovered.

6.3 The future of *Downtime*

While a first success was made with *Downtime* in the new area of artefact-based reflection, many additional factors and relationships are yet to be explored. As the study with which we tested the application was only two weeks long, we were not able to capture any possible long-term effects of *Downtime* and its rituals, such as well-being, life satisfaction or general health. For future development, knowledge about these effects would be of immense importance. Additionally, the features presented within the app need a careful assessment in terms of their effectiveness and how they are implemented. In general, a first step would be to make the rituals customizable in a way that users could compose their optimal routines to maximise their level of detachment. The goal here should be that the users can decide which feature they want to see in their evening or morning ritual and not being forced to take certain steps in the process that they might already perform outside of the ritual.

Regarding the features of *Downtime* themselves, a few suggestions for the future were already stated by the participants of this study. Having more options in creating a list of goals would give the users more freedom in using the application. Ordering their goals with an importance level or per date would give them an even greater sense of how to structure their workday and thus, potentially, enhancing the effect the rituals have on its performers. Additionally, based on the feedback, the tabs feature needs the most work. Developing a smarter algorithm that orders the tabs via certain criteria could be an interesting direction and is worth exploring. Lastly, the notifications acting as reminders for the users would need to be implemented correctly, since the interviews revealed that they are potentially useful for the users. With these improved features a long-term study on the effects of artefact-based reflections could lead to valuable insights about how psychological detachment is facilitated regarding knowledge workers.

6.4 Threats to validity

Hawthorne Effect: Since the participants knew that they were being observed during the study, they may have changed their behavior even if subconsciously. To counteract this threat we minimized contact to them throughout the study and let them interact with Downtime in their preferred way.

Interpretation Validity: During the transcription process, researchers might interpret statements from the participants differently from their intended meaning. Therefore, the interviews only contained open-ended question to give the participants the chance to elaborate in more detail.

Researcher bias: When presenting the results, it may happen that researchers only depict the results suitable for their conclusion. In order to prevent researcher bias all prominent statements from the participants as well as less common but still valuable opinions were included in the results.

Sample size: Four participants took part in the study described in this thesis. While this amount of participants is not enough to yield statistically significant results, it suffices for the qualitative approach which was used in this thesis. The quantitative data was used to highlight certain aspects of the qualitative data.

Sample diversity: Through including full-time and part-time students as well as a full-time employee in the study and having a mix of female and male participants, the sample diversity of the participants is given. Despite this, by only including one non-student in the study, the ability to generalize the results for all knowledge workers who do not study is limited.

Duration of the study: With the user study being conducted over a period of two weeks, we were able to capture initial feedback for our application and the rituals. However, to capture long-term effects of *Downtime* the length of the study would have to be longer.

Exam phase: The study took place during the exam phase at their university, which affected three of the four participants. As this is a phase of high stress, the results of the study might have been different, if being conducted earlier in the semester. However, the qualitative data showed that an effect of the rituals could still be captured and therefore analysed for this thesis.

Chapter 7

Conclusion

Information and communication technologies enable knowledge workers to be more flexible while working, but also introduce new challenges as people are now expected to be available at any times, which leads to difficulties in switching off mentally from work. Artefact-based reflection is a new concept introduced within this thesis to facilitate psychological detachment and help knowledge workers in creating boundaries between their work and non-work lives through reflecting on their workday and the work-artefacts they used throughout the day, such as tabs, files and e-mails. We developed an application called *Downtime* which encourages users to perform a ritual at the end of their workday in which they can reflect on their work, create goals for the next day, store or delete relevant work-artefacts and tidy up their work device. We conducted a two-week long user study to evaluate the application and its effects on detachment. The results showed that especially university students can benefit of such a ritual, as they have less structured work routines than employees at a company. Two of the student participants reported an increased level of detachment after using the application despite being in a phase of greater stress due to exams coming up. All three of the student participants reported a positive experience with *Downtime* and were able to create boundaries between their work and non-work lives. For employed participants, the developed application was not able to help them with detaching from work. Based on the knowledge we gained from the analysis of the qualitative and quantitative data, the reasons for this could lie in their already existing ways of reflecting upon work-artefacts they used during a workday. Our study is the first that explored facilitating psychological detachment through the reflection upon work-artefacts and offers a new area of research with great potential for future work. We conclude that this approach can support knowledge workers in detaching from their work and enable them to enjoy their evening without work-related thoughts, especially when they have problems in creating boundaries between their work and non-work lives.

Appendix A

Form of Consent

Consent Form: Downtime – Helping knowledge workers detach and reattach to work

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Purpose
Knowledge workers (people whose main capital is knowledge, e.g., Software Developers, Students or Engineers) often have difficulties detaching and reattaching from and to their work life, which, among other things, can lead to decreased productivity, higher fatigue or less satisfaction with personal lives. Within this study, an application (Downtime) will be tested, which introduces a morning and evening ritual that aims at helping knowledge workers with detaching and reattaching from and to work. The collected data will give insights on the effectiveness of the application regarding its purpose.

Study Procedure and Collected Data
The study is conducted over 10 workdays and consists of the following steps:

Prior to the start of the study, the participants will gain access to the application, a setup instruction, and a user study guide.

During the study period the participants will use the application in the morning (reattachment) and the evening (detachment) and follow the steps within Downtime. Data on their actions and how they use the application will be collected and stored locally on their computer (more details below). Using the application properly should take between 10-15 minutes daily.

After the study, a semi-structured interview will be conducted to gain insight on their experience with the application and the effect using Downtime had on their daily life. The interview will be audio recorded (if allowed by the participant) and should not take longer than 30 minutes.

Risks & Benefits
There are no risks involved in participating in this study, apart from the time investment. By participating, you contribute to our long-term objective to improve the well-being of knowledge workers. Additionally, the participants may find the application useful for their daily work life and experience higher mental detachment from their work. In that case the participants can use the application beyond the study, as long as they wish to use it.

Data Storage, Confidentiality & Retention
Within the application, various actions will be tracked and stored in a local database on the participant's device. This data mostly consists of numbers of how often an action within the app was triggered. The only personal data collected from each participant will be the username, goals, reflections, and URLs the participants often used during the day and decided to store within the app. It is possible for each participant to delete goals, reflections, and URL names at any point of the study from the database. E.g., should the user wish to not leave any goals, reflections, or URLs in the database, they can delete all of them before sending the database back for the analysis. This data will only be used for the analysis if the user allows it, which they can decide during the interview after the study.

The interview audio recording will be transcribed by Jonas Gebel and deleted after the transcription. All data will be treated confidentially. Your contact information will be stored separately from the data and will never be associated with it after analyzing it. In any case, anonymized, non-identifiable data will not be kept for longer than five years, after which we will permanently delete it.

Uses of the Study Data

For our research, we will only use pseudonyms with your data, and no identifying information will ever be shared outside of the research group and the confines of this study without your explicit permission. The results of this study will be published in a research paper and may potentially appear in both internal and external academic research presentations and publications, such as academic journals and conference proceedings. Data presented in presentations or publications will never allow identifying individual persons.

Contact for Information about the Study

If you have any questions or desire further information with respect to the study, you may contact Jonas Gebel (contact above).

Consent for Study Participation

Your participation in this study is entirely voluntary. You are free to withdraw your participation at any point during the study, without giving any reason and without any negative consequence. Any information you contribute up to your withdrawal will be retained and used in this study unless you request otherwise.

With your signature on this form, you confirm the following statements:

- I understand the goals and procedures of the study and the applicable conditions.
- I had the opportunity to ask questions. I understood the answers and accept them.
- I am at least 18 years old.
- I had enough time to make the decision to participate and I agree to the participation.

Please consider granting explicit permission to the following data collection practices:

[ ] I hereby accept the collection of visited URLs for the duration of the study.

[ ] I hereby accept the audio recording of the post study interview.

In no way does this waive your legal rights or release the investigators or involved institutions from their legal or professional responsibilities.

_____

Participant's name

_____ _____

Location, Date Participant's signature

Appendix B

User Study Guide

Downtime Study Guide

On this link you can find the necessary files for the User Study:

https://drive.google.com/drive/folders/1rZbwGlKK5cOV84f423456KDQ3KJU3V88

In the “downtime” folder you can find two additional files to the Study Guide. Please use them in the following way:

Form of Consent

- Download “Downtime_Form_of_Consent.pdf”, read through it and sign it.
- Please send the form to the following E-Mail address: jonas.gebel@uzh.ch

Downtime app

- Download the folder “Downtime.app.zip” (Click “Download Anyway” on the popup).
- After the file got downloaded, open your Finder and go to the Download folder.
- Select the application and move it into your Dock (Or any other location you find suitable. Preferably not the Desktop or Download folder).
- Right click the application and select “Open”.
- After the app opens, allow it to access your Download folder, Desktop folder and System Events.
- Downtime is able to send you push notifications which should remind you to use the app in the morning and evening. They will be sent at 8am and 5pm respectively. If you would like to receive them, please do not close Downtime entirely overnight, only the windows. If you close the app entirely, the only effect is that you won’t get the push notification in the morning. It does no harm to the application or the User Study.

Gstell zip folder

Additionally, you have received a zip folder called “gstell-3.0.2.zip”. This folder contains the Firefox extension that will track your visited URLs and enables Downtime to display them.

- Download the .zip file and save it in an easily accessible location (Preferably not the Desktop or Download folder).
- Open Firefox and go to the following URL: about:debugging#/setup
- In the left menu go to “This Firefox”.
- Click the button “Load Temporary Add-on”.
- Select the Gstell Zip folder and click “Open”.

Unfortunately, the Gstell extension (written by the Human Aspects of Software Engineering Lab) is only available as a temporary Add-on, which means it will be removed as an Add-on should you close Firefox entirely or Restart/Shut-down your computer. It will not be removed as long as you only close the Firefox window/s. In Downtime there is a connection status visible in the

upper right corner. Should that status show that you are not connected, then please check in the above-mentioned URL in Firefox if Gstell is properly installed in your Browser.

Also, since this Add-on tracks your URLs throughout the day, please do not close Downtime entirely after you have done the morning procedure. Otherwise, you won't be able to fully use Downtime in the evening.

During the User Study

In the morning:
- Go through the morning Process in Downtime ("Let's start the day" in the home menu).
- Follow the steps.
- Close the Downtime window but not the application.

During the day:
- There is no need to use the application during the day. However, if you wish to look at or update your goals you can do this via the menu "View Goal List".

In the evening:
- Go through the evening Process in Downtime ("I finished work for today!" in the home menu).
- Follow the steps.
- Close the Downtime window, but not the application (If you wish to receive a notification in the morning, otherwise you can also close the application).

End of the User Study

At the end of the User Study please send the Database file to the following E-Mail address: jonas.gebel@uzh.ch

You can find the Database at any time of the study under the following path: "/Users/<your_username>/Library/Application Support/downtime/database.sqlite".

To find this file, follow these steps:
- Open your Finder and select "Go" in the menu bar at the top of your screen.
- Select "Go to Folder…" (Second to last menu option).
- Copy paste the path given above with your username inserted.

At the end of the User Study there might be some personal information still in the database, e.g., reflections, goals, or URLs. These will not be considered for the analysis and will never be linked to you in any way. However, it will still be visible for writer of this Thesis. If you don't want your personal data to be seen during the analysis, follow these steps:
- Open Downtime and go to "View Reflections".
- Delete all the reflections you don't want to send.
- Select "Back" and go to "View Goal List".
- Select "Completed Goals" and delete all Goals you don't want to send.

- Before you delete a goal, select “Show tabs” and delete any of your saved tabs connected to that goal.
- When you are content select “Back” and repeat the last step for the uncompleted goals.

Deleting the personal data before sending in the database will not change the outcome of the analysis. It is just a choice each participant has, if they feel uncomfortable with their personal data stored in Downtime.

You are now ready to go!

If you have any questions, feel free to contact me under jonas.gebel@uzh.ch

Appendix C

Semi-structured Interview Guide

Downtime Post Study Interview

Opening Questions:

- What was your overall experience in this study?
- What was your overall experience using downtime?

Questions regarding pre-study time:

- How stressed would you rate yourself during work normally? Where does this stress come from? Overtime, Pressure to work/be available longer, high time pressure during work etc.
- How detached would you rate yourself during your free time normally?
- How often do you find yourself working even after normal work hours?
- Do you already have way of detaching from work? What are they?
- With the previous 4 questions in mind, are there any differences for you when working from home, instead of on site?

- How do you manage your file system usually? Frequency, Specific order, Time of the day/week?
- How do manage relevant web pages and open tabs usually? How do you save them, if at all?
- How do you manage your Mails usually? Different folders, all in inbox, delete right away etc.

Questions regarding the study:

- How stressed were you during the time of the study?
- How detached from work were you during the time of the study?
- Did you notice any changes regarding detachment from work during the last two weeks?

- How easy was it for you to incorporate downtime into your workday?
- Downtime consists of three major parts: Your goals, your reflections, and the technical interventions it proposes to you (Tabs, files/folder, mails/calendar).
    - What was your experience using the goals feature of downtime?
    - What was your experience reflecting on your workday in the evening ritual?
    - What was your experience of “cleaning” your workplace in the evening ritual?
        - What was your experience with each individual intervention for you? Were they useful or felt like a burden? Did you use them frequently or not at all? (Emphasize on getting feedback to each feature!)
- Overall, would you add/remove/change any features of downtime?

Questions regarding post-study time:

- Will you use downtime in the future?
- Would you use downtime if slight changes were made to it? If yes, what changes?

Closing Question:

- Is there anything you would like to share or mention that we didn’t talk about yet?

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